LG Chem Yeosu Complex	Material Safety Data Sheet	Identity No.	GHS – 2AA - 002
	METHYL ACRYLATE (CAS No. 96-33-3)	Pages	1/11

1. Identification of the product and the supplier

1) Product name : METHYL ACRYLATE, INHIBITED

2) Advisable use and Restriction

○ Advisable use :
- Acrylic fibers,
- leather finish resins, textile, paper coatings and plastic films, produces hardest resin of the acrylate ester series.
- In orthopedic surgery, methyl acrylate is mixed to make bone cement.
- Amphoteric surfactants, Vitamin B1, chemical intermediate.
- In medical, utilized as monomer, polymer or copolymer.

○ Restriction of product using : Use for recommended use

3) Manufacturer/Supplier/Distributor information

○ Company : LG Chem, LTD. Yeosu plant
○ Address : 55, Yeosusandan 2-ro, Yeosu-si, Jeonnam, 555-718, Korea
○ Emergency response number : 061-689-1331
○ Respondent : 2AA Team

2. Hazard identification

1) Hazard classification :

- Flammable liquid :	Category 2
- Acute toxicity (oral) :	Category 4
- Acute toxicity (dermal) :	Category 4
- Acute Toxicity(inhalation: vapour) :	Category 3
- Skin corrosion/irritation :	Category 2
- Eye Damage/Irritation :	Category 2A
- Skin sensitization :	Category 1
- Mutagenicity :	Category 2
- Target Organ Systemic Toxicity(single exposure) :	Category 3 (respiratory irritation)
- Aquatic acute toxicity :	Category 2

2) Allocation label elements

○ Pictogram and symbol

○ Signal word : Danger

○ Hazard statement

H225 Highly flammable liquid and vapour
H302 Harmful if swallowed
H312 Harmful in contact with skin
H331 Toxic if inhaled
H315 Causes skin irritation
H319 Causes serious eye irritation
H317 May cause an allergic skin reaction
H341 Suspected of causing genetic defects
H335 May cause respiratory irritation
H402 Harmful to aquatic life

○ Precautionary statements

- Prevention: P201: Obtain special instructions before use.
P202: Do not handle until all safety precautions have been read and understood.
P281: Use personal protection equipment as required.
P210: Keep away from flames and hot surfaces. - No smoking
P233: Keep container tightly closed.
P240: Ground/bond container and receiving equipment.
P241: Use explosion-proof electrical/ventilating/lighting/ equipment.
P242: Use only non-sparking tools.
P243: Take precautionary measures against static discharge.
P261: Avoid breathe dust/fume/gas/mist/vapours/spray.
P264: Wash thoroughly after handling.
P270: Do not eat, drink or smoke when using this product.
P271: Use only outdoors or in a well-ventilated area.
P272: Contaminated work clothing should not be allowed out of the workplace.
P273: Avoid release to the environment.
P280: Wear protective gloves/protective clothing/eye protection/face protection

- Response: P301+P311+P312: IF SWALLOWED: Call a POISON CENTER or doctor/physician of you feel unwell.
P302+P352: IF ON SKIN: Wash with plenty of soap and water.
P362+363: Take off contaminated clothing and wash before reuse. Wash contaminated clothing before reuse.
P303+P361+P353: If on skin (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P308+P313: IF exposed or concerned: Get medical advice/attention.
P321+P322: Specific treatment as reference to supplemental first aid instruction.
P304+P340: If inhaled: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305+P351+P338: In IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and wash to do. Continue rinsing.
P330: Rinse mouth.
P370+P378: In case of fire: Use for extinction

P337+P333+P332+P313: IF IN EYES or IF SKIN IRRITATION or rash occurs: Get medical advice/attention.

- Storage : P403+P235+P233 : Store in a well-ventilated place. Keep container tightly closed and cool.
  P405: Store locked up.
- Disposal : P501: Dispose of contents/container to in accordance with local/regional/national/international regulations (to be specified).

3) Other hazard information not included in hazard classification
- NFPA Rating system : Health: **3,** Flammability: **3,** Reactivity: **2**

3. Composition/information on ingredients

Chemical Name	Common name Synonyms	CAS No.	Content (%)
METHYL ACRYLATE	2-PROPENOIC ACID, METHYL ESTER ACRYLIC ACID METHYL METHYL PROPENOATE	96-33-3	>99.5

4. First-aid measures

1) Eye contact :
-In case of contact with chemicals, immediately flush eyes with running water for more than 15 minutes.
-Remove contact lenses if present and easy to do.
-Get immediate medical advice/attention if irritating, pain, swelling, tear, dazzling eyes occur.

2) Skin contact
-Wash with plenty of water and soap.
-Wash and dry carefully contaminated clothing and shoes.
-If irritation persists, contact a poison control center or a doctor for treatment advice.
-Wash contaminated clothing and shoes before reuse.

3) Inhalation
-Move victims immediately to place with fresh air and not contaminated area.
-Get medical attention immediately if inhaled.

4) Ingestion
-If person is conscious, do induce vomiting.
-If swallowed or drink, immediately call a POISON CENTER or doctor/physician.

5) Acute and delayed symptoms/effects
-Inhalation :
short-term exposure : Cause irregular breathing.
-Skin contact :
short-term exposure: Cause skin irritation such as erythema and edema.

-Eye contact :
short-term exposure: Cause conjunctivae irritation.

6) Indication of immediate medical attention and notes for physician
-Rinse the mouth.
-Get medical attention if needed.
-Call 911 or emergency medical service.
-Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
-Keep victim warm and quiet.
-Move victim to fresh air, administer oxygen if breathing is difficult and give artificial respiration if victim is not breathing
-Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.

5. Fire-fighting measures

1) Suitable (and unsuitable) extinguishing media
○ suitable extinguishing media:
-Small fire: Dry chemical, CO_2, water spray, alcohol-resistant foam
-Large fire: Water spray, fog or alcohol-resistant foam
○ unsuitable extinguishing media: Do not use straight streams.
○ In case of major fire and large quantities:
-Move containers from fire area if you can do it without risk.
○ tank/trailer/train truck fire:
-Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
-For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.
-Cool containers with flooding quantities of water until well after fire is out.
-Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
-ALWAYS stay away from tanks engulfed in fire.
-If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

2) Specific hazards arising from the chemical
○ Thermal decomposition products
-Carbon oxides (CO, CO_2)
○ Fires and an explosion
-HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
-Vapors may form explosive mixtures with air
-Runoff to sewer may create fire or explosion hazard
-Vapor explosion hazard indoors, outdoors or in sewers
-Containers may explode when heated.
-Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
-Vapors may travel to source of ignition and flash back.

3) Special protective equipment and precautions for fire-fighters
-Wear positive pressure self-contained breathing apparatus (SCBA).
-Structural firefighters' protective clothing will only provide limited protection.

6. Accidental release measures

1) Personal precautions, protective equipment and emergency procedures
-Stay upwind.
-Consider initial downwind evacuation for at least 300 meters (1000 feet).
-Keep out of low areas.
-CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.

2) Environmental precautions and protective procedures
○ Atmosphere : Require local exhaust ventilation system.
○ Land : Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
○ Underwater : Prevent entry into waterways, sewers, basements or confined areas.

3) The methods of purification and removal
○ Small spill
-ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area)..
-All equipment used when handling the product must be grounded.
-Do not touch or walk through spilled material.
-Stop leak if you can do it without risk..
-Prevent entry into waterways, sewers, basements or confined areas.
-A vapor suppressing foam may be used to reduce vapors.
-Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
-Use clean non-sparking tools to collect absorbed material.
○ Large spill
-Dike far ahead of liquid spill for later disposal.
-Water spray may reduce vapor; but may not prevent ignition in closed spaces.

7. Handling and storage

1) Precautions for safe handling
-DO NOT eat, drink or smoke in product area.
-Wash thoroughly after handling.
-Wear suitable and approved protective equipment.
-Do not breathe gas/fumes/ vapor/spray.
-Avoid heat, sparks, open flames and other ignition sources.
-Avoid contact with skin or clothing.

2) Conditions for safe storage
-Store locked up.
-Read special instructions before use.
-Keep away from water and sewage.
-Keep away from anaerobic condition.
-Keep away from inactive gas.
-Store and handle in accordance with all current regulations and standards.
-Storage life is 6 months.
-Store in a dry and well-ventilated area.
-Store below 30℃
-Keep away from inactive gas
-Avoid contact with mixture.

8. Exposure controls/personal protection

1) Occupational Exposure Limits
○ Regulation in Korean: TWA: 2ppm(7mg/m^3) [skin]
○ US (NIOSH/OSHA AGGIH):
-OSHA PEL: 8hr TWA : 10 ppm (35 mg/m^3) [skin]
-NIOSH PEL: 10hr TWA : 10 ppm (35 mg/m^3) [skin]
-ACGIH: 8hr TWA : 2 ppm [skin, sensitization]
○ Biological exposure index : Not available

2) Appropriate engineering controls
-Provide blaster resistance equipment at ventilation system if when explosive risk.
-Provide local exhaust ventilation or other engineering controls to keep concentration of airborne under threshold limit value.
-Check legal suitability of exposure level.

3) Personal protective equipment
○ Respiratory protection
Respirator Recommendations NIOSH/OSHA
-Up to 100 ppm:
(APF = 10) Any supplied-air respirator
-Up to 250 ppm:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece
-Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
-Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

○ Eye protection
-Wear facepiece with goggles to protect from scattering dust or toxic liquid.
-An eye wash unit and safety shower station should be available nearby work place.

○ Hand protection
-Wear appropriate chemical-resistant gloves that protect chemicals directly.

○ Body protection
-Wear appropriate protective chemical-resistant clothing.

9. Physical and chemical properties

1) Appearance	Physical state : Clear liquid . Color : colorless
2) Odor	Acid odor
3) Threshold of odor	Water: 0.0021 mg/l, Water: 0.0021 mg/l
4) pH	Not available
5) Melting point/freezing point	-75℃
6) Initial boiling point and boiling range	80.5℃ (DIN 51751)
7) Flash point	-3℃ (27 ℉) (OPEN CUP), -2.8℃ (closed cup, DIN 51 755)
8) Evaporation rate	Not available
9) Flammability (solid, gas)	Highly flammability
10) Upper/lower flammability or explosive limits.	lower: 2.1 vol% (- 6˚C) upper: 14.5 vol% (30˚C)
11) Vapour pressure	89.2 mmHg (20˚C)
12) Solubility(ies)	25 g/L (25 ℃)
13) vapour density	4.42 (air= 1)
14) Specific gravity	0.9535 (20˚C /4℃)
15) n-octanol/water partition coefficient	log Kow= 0.739 (20˚C)(OECD TG 107)
16) Auto ignition temperature	393˚C
17) Degradation temperature	Not available
18) Viscosity	Not available
19) Molecular weight	82.06g/mol

10. Stability and reactivity

1) Chemical stability
-Stable under normal temperatures and pressures

2) Possibility of hazardous reactions
-Avoid heat or light and control inhibitor.
-Containers may explode when heated.

3) Conditions to avoid
-Avoid heat, sparks, open flames, or other sources of ignition.
-Containers may explode or ignite when contact with combustible materials.
-Keep away from water and sewage

4) Incompatible materials
-Acids, bases, oxidizing agents, peroxides.

5) Hazardous decomposition product
-Thermal decomposition product : Carbon oxides

11. Toxicological information

1) Information on the likely routes of exposure
○ Inhalation: Cause irregular breathing.
○ Skin contact: Cause skin irritation such as erythema and edema
○ Eye contact: Cause conjunctivae irritation.

2) Symptoms related to the physical, chemical and toxicological characteristics
-Flammable liquid: Category 2
-Explosives, Water reactive substances, Oxidizing solid, Self-reactive substances, Organic peroxides: Not applicable (no relevance to molecular structure)
-Refer to "5) Acute and delayed symptoms/effects" of "4.First aid measures"

3) Delay by short term and long term exposures, acute and chronic effect
○ Acute toxicity - Oral : Category 4, LD_{50} = 765mg/kg bw (Rat)
- Dermal : Category 4, LD_{50} = 1243 mg/kg bw (Rabbit)
- Inhalation (vapour) : Category 3, LC_{50}= 5.7 mg/L/4hr (Rat)

○ Skin Corrosion/ Irritation: Category 2
-Highly irritating on human skin and 72 hours after exposure with semi-occlusive, erythema (grade 2~3) was found and after occlusive test, erythema (grade3) in 5 rabbits, necrosis and edema (grade4) were seen in 1 animal.

○ Serious Eye Damage/ Irritation: Category 2A
-After seven days the cornea showed moderate to severe opacity with no details of the iris visible. In addition slight iritis and moderate to severe lesions of the conjunctivae were noticeable.

○ Respiratory sensitizer: Not available

○ Skin Sensitization: Category 1
-From human open epicutaneous test and guinea pig Maximization test and modified Draize test, sensitizing effects were shown.

○ Carcinogenecity : Not classified
-US EPA: Group D, IARC: Group 3, ACGIH: A4
-NTP, OSHA, Regulation 1272/2008, : Not listed
-From two years carcinogenecity test with rat, the incidence of adenoma and tumor lesion was not indicated.

○ Mutagenicity : Category 2
- *In vitro*: Methyl acrylate was negative in a variety of studies for point mutation both in the presence (Ames test only) and in the absence of metabolic activation but induced chromosome aberrations in chinese hamseter cells.
-*In vivo*: Drosophila SLRL test indicated negative effect but Micronucleus assay showed positive effect.

○ Reproductive toxicity : Not classified
-In the repeated study, substance was not related the effects of fertility, teratogenicity and developmental toxicity.
NOEL for maternal toxicity=25 ppm (0.089 mg/L),
NOEL for developmental effects (fetotoxicity) =50 ppm (0.179 mg/L),
NOEL for developmental effects (teratogenicity) =100 ppm (0.358 mg/L)

○ Specific target organ toxicity (single exposure) : Category 3 (respiratory irritation)
-Guinea pig showed clinical signs included convulsions and irregular breathing at 500 mg/kg.

○ Specific target organ toxicity (repeated exposure): Not classified
-The increase in relative kidney weights and the histopathological observations indicate that the highest dose may have had a slight effect on the kidneys but no other histopathological effects were seen on rat exposed for 13 weeks by oral administration.

○ Aspiration hazard : Not available

12. Ecological information

1) Aquatic Ecotoxicity
-Acute toxicity: Category 2
-Chronic toxicity: Not classified
○ Fish : 96hr-LC_{50}(*Cyprinodon variegatus*) = 1.1 mg/l (OECD TG 203, GLP)
○ Crustacea: : 48hr-EC_{50}(*Daphnia magna*) = 2.2 mg/l
○ Algae : 72hr-ErC_{50}(*Selenastrum capricornutum*) = 3.55 mg/l

2) Persistence and degradability
○ Persistence : Since logKow is less than 4, there is no persistent possibility.
(logKow=0.73 (OECD TG 107))
○ Degradability
-Hydrolysis: pH7: over 28days, pH11: 1.8 hours
-Photolysis: half-life = 14.5hours

3) Bioaccumulative potential
○ Biodegradation : readily biodegradation, 90~100% biodegradation after 28days
(ISO 14593 (identical to OECD 310), GLP)
○ Bioaccumulation : BCF =2.4, Since low logKow(logKow=0.73(OECD TG 107)), there is low persistent possibility.

4) Mobility in soil
- low potency of mobility to soil (Koc=5.84 l/kg)

5) Others: Not available

13. Disposal considerations

1) Disposal method
-Incinerate waste.
-Incinerate residues after treatment by methods of evaporation and condensation.
-Incinerate residues after purification by methods of separation, distillation, extraction and filtration.
-Treat with reactions such as neutralization, oxidation, reduction, polymerization and condensation.
-Incinerate residues after treatment by the methods of cohesion, precipitation, filter and dehydration.

2) Disposal precaution
-Consider the require attentions in accordance with waste treatment management regulation.

14. Transport information

1) UN Number : UN1919
2) UN Proper shipping name : METHYL ACRYLATE,STABILIZED
3) Transport Hazard class : class 3
4) Packing group : II
5) Marine pollutant : Applicable
6) Special safety response for transportation or transportation measure
○ Emergency schedule for fire : F-E
○ Emergency schedule for spillage : S-D

15. Regulatory information

○ Korea
- Korea Occupational Safety and Health Regulation: Listed in occupational exposure limits
- Toxic Chemical Control Act. : Listed inSubstances requiring preparation for accidents
- Dangerous Material Safety Management Regulation : Not applicable
- Waste Control Act. : Not applicable

○ EU Classification
- Classification: F; R11 Xn; R20/21/22 Xi; R36/37/38 R43
- Risk phrases : R11, R20/21/22, R36/37/38, R43
- Safety phrases : S2, S9, S25, S26, S33, S36/37, S43

○ U.S.A. management information
- OSHA regulation (29CFR1910.119) : Not applicable
- CERCLA 103 regulation (40CFR302.4) : Not applicable
- EPCRA 302 regulation (40CFR355.30) : Not applicable
- EPCRA 304 regulation (40CFR355.40) : Not applicable
- SARA 313 regulation (40CFR372.65) : Listed

○ Rotterdam Convention on the prior informed consent procedure for certain hazardous chemicals and pesticides in international trade : Not applicable
○ Stockholm Convention on Persistent Organic Pollutants (POPs) : Not applicable
○ Mont- real Protocol on Substances that Delete the Ozone Layer : Not applicable

16. Other information

1) Information source and references:

-ECB-ESIS (European chemical Substances Information System) (http://ecb.jrc.it/esis)
-International Uniform Chemical Information Database (IUCLID) (http://ecb.jrc.it/esis)
-Organization for Economic Co-operation and Development (OECD) Screening Information Data Set (SIDS)
-IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT. (Multivolume work)., p. S7 216 (1987)
-REGULATION (EC) No 1272/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2008
-Korea Occupational Health & Safety Agency: http://www.kosha.net
-U.S. National library of Medicine (NLM) Hazardous Substances Data Bank (HSDB): (http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB.htm)
-ECOTOX Database, EPA (http://cfpub.epa.gov/ecotox)
-ACGIH, TLV and BEIs # 0108, 2008
-The Estimation Programs interface (EPI) Suites, Syracuse Research Corporation
-NITE: http://www.safe.nite.go.jp/japan
-Korea waste control act
-Korea dangerous material inventory management system (http://hazmat.nema.go.kr)
-National chemicals information systems (http://ncis.nier.go.kr)

2) Issue date : 1997. 1. 20 2014. 3. 7

3) Revision number and date : 2014. 3. 7 (9th)

4) Other material safety data sheet information:
LG Chem LTD., Korea Occupational Health & Safety Agency